Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 – 19. (Canceled)

20. (New) A sputtering power supply unit comprising:

a DC power source which supplies a DC current to a sputtering apparatus;

a current control unit including a current control element connected in series with the sputtering apparatus across a positive terminal and a negative terminal of the DC power source and at least one choke coil connected serially between the current control element and the sputtering apparatus for maintaining the DC current at a preset value;

a current detection unit for detecting a current supplied to the sputtering apparatus via the choke coil from the DC power source;

a voltage detection unit for detecting a voltage across the positive and negative terminals of the sputtering apparatus; and

an arc stopping circuit including a first switch which is closed by a voltage detection output signal obtained in the voltage detection unit in response to an arc discharge generated in the sputtering apparatus and a reverse voltage source for supplying a reverse voltage across the power source terminals of the sputtering apparatus for stopping the arc discharge via the first switch;

wherein the current control unit comprises:

means for calculating an instantaneous power supplied to the sputtering apparatus from the voltage detected by the voltage detection unit and the current detected by the current detection unit;

integration means for detecting and integrating an error between the instantaneous power and a desired set power;

means for generating a pulse output having a pulse width corresponding to a difference between a current setting value formed on the basis of an integration output obtained from the integration unit and the current detected by the current detection unit;

means for controlling a current flowing through the current control element by feeding back the pulse output to a control terminal of the current control element; and

holding means for stopping an integration of the integration means when the first switch is closed in response to the arc discharge to hold the integration output of the integration means when the integration is stopped;

whereby a current flowing through the current control element is controlled in a feed-forward manner with a duty corresponding to the integration output held by the holding means.

21. (New) A sputtering power supply unit according to claim 20, which further comprises a reverse-direction arc prevention circuit connected between the arc stopping circuit and the sputtering apparatus for preventing a reverse-direction arc discharge caused by a reverse voltage supplied to the sputtering apparatus from the arc stopping circuit in response to an occurrence of the arc discharge.

22. (New) A sputtering power supply unit according to claim 20, wherein the current control unit comprises a comparator having a hysteresis for comparing the current set value formed on the basis of the integration output obtained in the integration means and a current detected in the current detection unit, and a driving circuit outputting a current control signal for outputting the current control element in response to the comparison output.

23. (New) A sputtering power supply unit according to claim 20, wherein the current control unit comprises:

an operational amplifier for performing a calculation,

Iset *L-CM*L+VM*T

wherein Iset denotes a set current value based on an integration output obtained from the integration means, CM denotes a current value detected at the current detection unit, VM denotes a voltage value detected at the voltage detection unit, and L denotes an inductance of the choke coil;

a division circuit which divides an output value of the operational amplifier by an output voltage Vi of the DC power source; and

a driving circuit for outputting the current control signal in accordance with a division output of the division circuit.

24. (New) A sputtering power supply unit according to claim 20, wherein the DC power source includes a first rectifier circuit for rectifying a multi-phase alternating power source voltage to a DC voltage, a conversion circuit for converting the DC voltage from the first rectifier circuit to a pulse voltage, and a pulse transformer having a primary coil supplied with the pulse voltage and a secondary coil connected with a second rectifier circuit;

the current control unit includes a switching circuit acting as the current control element for supplying the DC voltage rectified by the first rectifier circuit to the primary coil of the pulse transformer as an alternately reversing pulse voltage at a predetermined interval of time, and at least one choke coil serially connected between one of output terminals of the second rectifier circuit provided in the secondary coil of the pulse transformer and one of power source terminals of the sputtering apparatus; and

the reverse voltage source of the arc stopping circuit includes an auxiliary rectifier circuit for rectifying an alternating voltage generated in the secondary coil of the pulse transformer, and a capacitor configured to be charged with a DC voltage from the auxiliary rectifier circuit.

25. (New) A sputtering power supply unit according to claim 22, wherein the DC power source includes a first rectifier circuit for rectifying a multi-phase alternating power source voltage to a DC voltage, a conversion circuit for converting the DC voltage from the first rectifier circuit to a pulse voltage, and a pulse transformer having a primary coil supplied with the pulse voltage and a secondary coil connected with a second rectifier circuit;

the current control unit includes a switching circuit acting as the current control element for supplying the DC voltage rectified by the first rectifier circuit to the primary coil of the pulse transformer as an alternately reversing pulse voltage at a predetermined interval of time, and at least one choke coil serially connected between one of output terminals of the second rectifier circuit provided in the secondary coil of the pulse transformer and one of power source terminals of the sputtering apparatus; and

the reverse voltage source of the arc stopping circuit includes an auxiliary rectifier circuit for rectifying an alternating voltage generated in the secondary coil of the pulse transformer, and a capacitor configured to be charged with a DC voltage from the auxiliary rectifier circuit.

26. (New) A sputtering power supply unit according to claim 23, wherein the DC power source includes a first rectifier circuit for rectifying a multi-phase alternating power source voltage to a DC voltage, a conversion circuit for converting the DC voltage from the first rectifier circuit to a pulse voltage, and a pulse

transformer having a primary coil supplied with the pulse voltage and a secondary coil connected with a second rectifier circuit;

the current control unit includes a switching circuit acting as the current control element for supplying the DC voltage rectified by the first rectifier circuit to the primary coil of the pulse transformer as an alternately reversing pulse voltage at a predetermined interval of time, and at least one choke coil serially connected between one of output terminals of the second rectifier circuit provided in the secondary coil of the pulse transformer and one of power source terminals of the sputtering apparatus; and

the reverse voltage source of the arc stopping circuit includes an auxiliary rectifier circuit for rectifying an alternating voltage generated in the secondary coil of the pulse transformer, and a capacitor configured to be charged with a DC voltage from the auxiliary rectifier circuit.

27. (New) A sputtering power supply unit according to claim 24, wherein the driving circuit in the current control unit includes a sample-hold circuit for performing a sample-hold operation for a division output of the division circuit, a pulse generation circuit generating a pulse signal having a pulse width corresponding to an output of the sample-hold circuit as the current control signal, and a timing circuit configured to determine a sampling period of the sample-hold circuit.

28. (New) A sputtering power supply unit according to claim 25, wherein the driving circuit in the current control unit includes a sample-hold circuit for performing a sample-hold operation for a division output of the division circuit, a pulse generation circuit generating a pulse signal having a pulse width corresponding to an output of the sample-hold circuit as the current control signal,

and a timing circuit configured to determine a sampling period of the sample-hold circuit.

29. (New) A sputtering power supply unit according to claim 26, wherein the driving circuit in the current control unit includes a sample-hold circuit for performing a sample-hold operation for a division output of the division circuit, a pulse generation circuit generating a pulse signal having a pulse width corresponding to an output of the sample-hold circuit as the current control signal, and a timing circuit configured to determine a sampling period of the sample-hold circuit.

30. (New) A sputtering power supply unit according to claim 24, wherein the current control unit further comprises a primary current detection circuit for detecting a current flowing in the primary coil of the pulse transformer, and means for stopping the pulse output from the pulse generation circuit when the current value detected in the primary current detection circuit to prevent a magnetic saturation of the pulse transformer from occurring.

31. (New) A sputtering power supply unit according to claim 25, wherein the current control unit further comprises a primary current detection circuit for detecting a current flowing in the primary coil of the pulse transformer, and means for stopping the pulse output from the pulse generation circuit when the current value detected in the primary current detection circuit to prevent a magnetic saturation of the pulse transformer from occurring.

32. (New) A sputtering power supply unit according to claim 26, wherein the current control unit further comprises a primary current detection circuit for detecting a current flowing in the primary coil of the pulse transformer, and means

for stopping the pulse output from the pulse generation circuit when the current value detected in the primary current detection circuit to prevent a magnetic saturation of the pulse transformer from occurring.

33. (New) A sputtering power supply unit according to claim 30, wherein the current control unit further comprises a CR oscillation circuit supplied with an output of the comparator having the hysteresis to supply a switching signal to the switching circuit according to an oscillation output of the CR oscillation circuit.

34. (New) A sputtering power supply unit according to claim 31, wherein the current control unit further comprises a CR oscillation circuit supplied with an output of the comparator having the hysteresis to supply a switching signal to the switching circuit according to an oscillation output of the CR oscillation circuit.

35. (New) A sputtering power supply unit according to claim 32, wherein the current control unit further comprises a CR oscillation circuit supplied with an output of the comparator having the hysteresis to supply a switching signal to the switching circuit according to an oscillation output of the CR oscillation circuit.

36. (New) A sputtering power supply unit according to claim 23, wherein at least the operational amplifier and the division circuit are composed of a microcomputer.

37. (New) A sputtering power supply unit according to claim 27, wherein the operational amplifier, the division circuit and the sample-hold circuit are composed of a microcomputer.

38. (New) A sputtering power supply unit according to claim 28, wherein the operational amplifier, the division circuit and the sample-hold circuit are composed of a microcomputer.

39. (New) A sputtering power supply unit according to claim 29, wherein the operational amplifier, the division circuit and the sample-hold circuit are composed of a microcomputer.